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TOWARDS A CLIMATE PROOF REDEVELOPMENT OF NAPLES WATERFRONT

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HIGHLIGHTS

- Rediscovery of water
 - The waterfront redevelopment represents an occasion to redesign port-city interface considering, in the design process, strategies aimed to increase cities resilience in terms of mitigation and adaptation to climate change.
 - Perspective change for a reinterpretation of the waterfront.
 - Waterfront areas could be considered as trigger of renewal processes with repercussions on wider contexts influencing the urban context in its entirety.
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ABSTRACT

This work proposes a reflection on one of the emerging themes of spatial planning: the redevelopment of waterfronts, outlining, in its approach, the need for extreme sensibility to the impacts of climate change.

The analysis introduces a temporal reconstruction of the practices and principles that have oriented the city and its relationship with water, as well as the management in government activities of the territory, related with this relationship. Starting from the case study represented by the waterfront of Naples, the work aims to define an exportable and replicable approach. The final goal is to implement a requalification able to re-updating the relationship between waterfront and territory and, at the same time, to consider the issue of climate change in relation to the impacts produced in these areas. This new approach can generate redevelopment and become an opportunity to regain a lost relationship between urban fabric and sea. Furthermore it's an opportunity for an overall economic and managerial reorganization of the urban- metropolitan areas.

The work, aware of the complexity of the theme, present the case of Naples as emblematic of the contemporary challenge for innovative planning based on an integrated and climate proof approach, able to combine synergistically the reality of the city, the coast and the sea in a framework of territorial sustainability and climate resilience.

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1. INTRODUCTION

There is an inseparable dialectical relation between the city and its waterfront, which has gone through very different phases throughout the years. In particular, in recent decades, this relationship has undergone a radical transformation that has generated a rediscovery of waterfront.

The various transformations can lead, in fact, to the visual and functional recovery of the city's relationship with water, to transform degraded and abandoned marginal areas, to preserve and enhance the local identity and to recover the abandoned industrial heritage.

Waterfront can, therefore, be considered as a place of innovation and imagination with great potential value, where new ambitions for the future of the city are concentrated. Moreover, it can be seen as a complex conglomeration of situation in which all the contradictions and problems of urban planning and design are synthesized.

All this can be considered a highly topical issue, recognizing the value of the multiple interventions of waterfront redevelopment: operations of revitalization of areas in contact with water, with strategic value for the involved areas and, often, resolution of the problems in which the areas find themselves.

In this sense, if in the past waterfront redevelopment operations focused on the integration into the city system of urban voids and disused areas resulting from relocation phenomena, today the emergency represented by climate change management pushes us to observe the redevelopment of waterfronts from a renewed point of view, which can integrate and merge these two components.

These areas redevelopment operations therefore play a fundamental role if they succeed in incorporating resilience strategies into the design process, to allow the waterfront to adapt that reads territorial vulnerabilities and redirect the project in terms of effectiveness and efficiency.

2. REDISCOVERING THE WATERFRONT IN CITIES

Water has always played an important role for the city, shaping its formation, image and identity. It is a basic element for the foundation and birth of various settlements, influencing, in a decisive way, their evolution. As a resource that surrounds and penetrates the city, water seems to design and changes it, identifying itself as an agent of transformation (Barreca, 2014), a sort of rule of characterization and morphological structure that shapes the territory.

Water is therefore an added value and in recent years there has been a general rediscovery of its value in cities, through a series of revitalization and redevelopment of waterfronts, through which the role of water has been reinvented and reinterpreted (Bruttomesso, 2007).

When reference is made to the evolution of waterfront, there is a tendency to associate it with the evolution of the city-port relationship, since the waterfront is considered to coincide with the port and its activities. The port structures, in the passage from the industrial to the post-industrial phase, have generated a series of neglected areas, disused interstitial spaces, which have become de-

INTERPRETATIVE MODELS				
CENTURY	BIRD	HOYLE	VALLEGA	NORCLIFFE
Up to XIX	Setting	Primitive port/city	Mercantile	Symbiosis
XIX - XX	Expansion	Expanding port/city	Industriale	Rise of "non-port" Places
Half XX		Modern industrial port/city	Neo-industriale	
1960 - 1980	Specialization	Retreat from the waterfront	Post-industriale	Rise of "non-places" Port
1970 - 1990		Redevelopment of waterfront		

Figure 1: Comparative scheme of interpretative models of the port-city interface evolution.
Source: drawings by authors.

graded areas due to their abandonment (Roseti, 2007).

It can therefore be argued that the relationship between ports and urban centers has undergone, over the centuries, a continuous evolution and transformation due to the different needs that emerged during the different eras (Condò, 2007). Many of the geographical studies carried out in the past about port and port cities, tended to focus attention on urban land use problems and organization and on the development of traffic structures and port equipment (Hoyle, 1988). It was only later that scholars questioned the policies and problems pertinent to port-city interface.

This change of perspective is certainly significant, highlighting the importance and need of integrated planning able to bring together the port element and urban dynamics, enhancing the relations between the two sides (Delponte, 2009).

Over time, scientific production has proposed various interpretations to possible evolutionary models of the relationship between the city and its waterfront, in particular between the city and the port. The elaborated diagram (Figure 1) analyzes and summarizes the interpretative models based on the relationship between port phenomena and city evolution, taking into consideration geographical and historical dynamics and the effects on the port-city interface.

From the primordial relationship based on strong integrity and mutual interdependence, with the continuous evolution of cities, the relationship between this and its waterfront has become increasingly fleeting and fragmentary, leading to a deep separation, both physical and symbolic, between the two elements of city and water.

The reasons for this separation are many and, some of them, can be summarized as follows: maritime traffic development, technological innovation of ship, infrastructural response of port areas to different maritime traffic and size of ships, different administrative skills, different ways of planning (port plan vs. urban plan), incompatibility between port activities and urban ones, expansion of container traffic, greater need for efficiency, security and flexibility of ports (Hoyle, Pinder, & Husain, 1994; Pavia & di Venosa, 2012).

The growth of ports has, in fact, created its own self-referentiality, an introverted position in the absence of interference with the outside, generating incompatibility between port activities and urban life.

Today the port areas have definitively separated

from the urban centers, acquiring a strong autonomy: city and port, in fact, assume distinct identities with complex and dynamic relationships in continuous metamorphosis.

As pointed out so far, last few decades have had a considerable influence on the transformation of the relationship between city and its waterfront. If on one hand ports seem to have needed more autonomy, which has resulted in a definitive separation (spatial and cultural) from cities, on the other hand, the latter claim for greater integration and deeper dialogue.

In Italy the situation is mostly different: the large ports are still operational in the city centers and, therefore, the redevelopment process is more complex, requiring a necessary integration process. In Italy, moreover, the phenomenon of waterfront redevelopment has arrived late, encountering greater difficulties than in other countries for various reasons: lack of relocation of industrial activities and consequent operation of the ports within the fabric of the city; recognition of the intrinsic values of some ports, in relation to the existence of works of high architectural, historical and monumental value; overlap and contrast of different interests, skills and powers.

3. WATERFRONT REDEVELOPMENT PROCESSES IN A CLIMATE CHANGE CONTEXT

The relationship evolution between city and waterfront, coupled with the processes of delocalization and dismantling mentioned above, has generated the start of a new urban phenomenon, characterized by substantial operations and redevelopment programs, which can be identified under the name of "waterfront redevelopment". These experiences derive from the process of progressive abandonment of those spaces that were previously used by industry or port activities, later transferred and relocated to other coastal areas. From this point of view, the marginal spaces between city and water, often corresponding to places in a state of decay, become an opportunity for recovery and reflection on their function in the contemporary world. In this way, it is possible to start substantial redevelopment operations and initiatives aimed at reintegrating these areas into the urban system. The first attempts at urban regeneration of abandoned port areas were carried

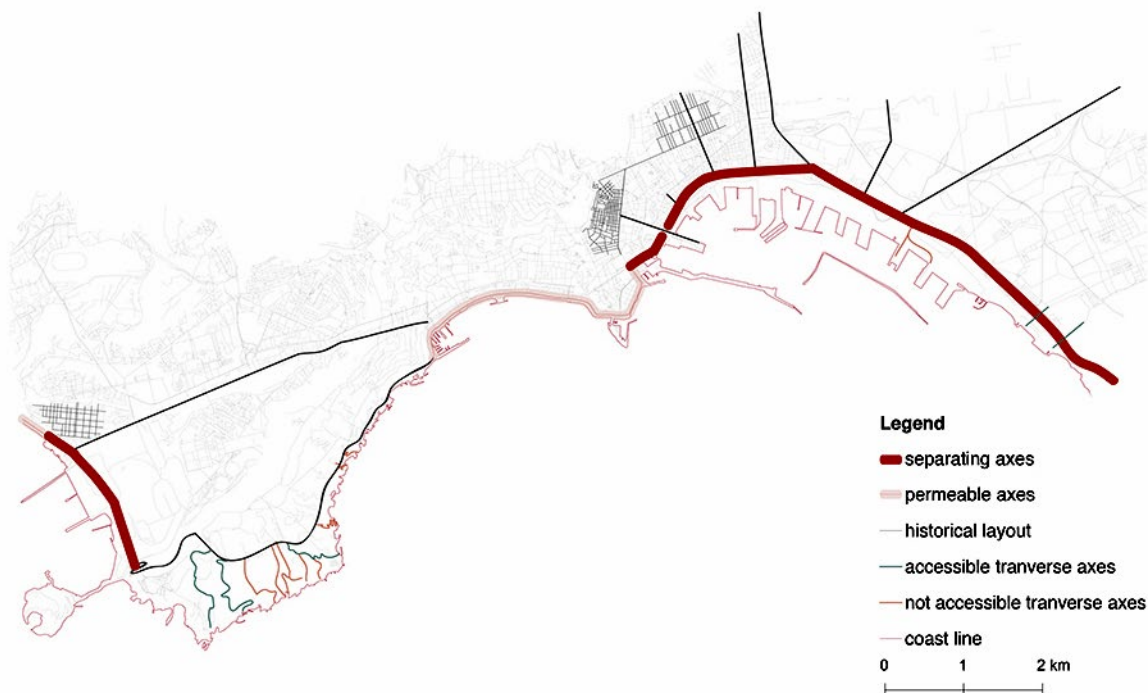


Figure 2: Classification of road axes according to accessibility and usability of the waterfront system.
Source: drawing by authors

out in cities such as Boston, Baltimore and San Francisco around the 1960s and 1970s (Musso, 1996), which soon became reference models. The recovery of these areas can be considered an opportunity, but above all a challenge for contemporary urban planning, to restore sense and future (Secchi, 1986) to those parts of the coast that have lost their identity.

The analysis of the countless cases of waterfront redevelopment certainly shows how, starting from the recovery of the interrupted relationship between the city and its sea, results can be obtained not only in terms of physical redevelopment of places, but also of functional revitalization of important central areas. At the same time, these redevelopments generate the activation of important flows, including economic ones, and sometimes experiment aimed to increase cities resilience in terms of mitigation and adaptation to the impacts induced by climate change.

In explaining some examples and the results achieved, the research highlights the absence of a way to operate, univocally determined, readily available, always and everywhere valid: every operation, in fact, is the prerogative of a specific system, of a specific historical and cultural context but, above all, of particular local conditions. The

mere replication of a successful operation brought back into a different context from the original one, without a careful study of the underlying process, risks being based on assumptions that are not solid and not appropriate, but, above all, to generate failed experiences. It should be highlighted, however, that the non-replicability of best practices, *sic et simpliciter*, and the idealization of projects with positive results, as models to imitate, does not deny the possibility of creating an approach methodology and scientific analysis for waterfront redevelopment that is at the same time replicable. Crucial point of the research is the need to generate a change of perspective, a new approach in the interpretation of the waterfront on which to base the redevelopment processes, in a relationship of greater interchange between the city and its coastline. First of all, it should be considered that the waterfront cannot be reduced to a linear stretch, simplified as an introverted and isolated area, but rather it must be understood as an integral part of the city, a city territory strip with variable depth and width, to be assessed according to local contexts. Secondly, acting on the waterfront areas means addressing their reverberation within a wider territorial context (Badami & Ronsivalle, 2008).

In this sense, the transformations of waterfront areas must be grafts of transformative processes capable of intercepting larger portions of the city, to become opportunities for the revival of larger urban contexts (Gargiulo & Cerrone, 2011). Another moment of reflection is linked to the peculiarity of the waterfront as an area within which multiple factors interact, different levels of expertise, numerous disciplinary fields and interests, often difficult to manage (Giovinazzi, 2010; Carta 2013). From this point of view, the research assumes a change of perspective that contributes to a governance metamorphosis that, from an arena of conflict and powers separation, can become a place of peaceful confrontation, in which the logic of sectoral policies can be overcome by a new perspective aimed at integration.

Moreover, in the processes of waterfront redevelopment a change of perspective on the issues related to climate change must be implied. The research highlights how the waterfront, as vulnerable part of city subject to several climate risks, and its redevelopment, represent an opportunity to experiment with actions to increase the resilience of cities in terms of adaptation to climate impacts. In the years when, the issue of climate change is becoming increasingly relevant, it becomes appropriate to take advantage to redesign these areas as an opportunity to consider, in the design process, the issue of climate change management.

4. NAPLES: THE DENIED-SEA CITY

Starting from the framework described above, this work wanted to define some strategies aimed at the waterfront redevelopment of the city of Naples, through an approach aimed at the change of perspective described above.

Given the osmotic relationship of the city with its sea, in order to stigmatize and contextualize this relationship, it was necessary to investigate its background, to define and identify the historical, economic, socio-cultural and environmental events that have determined the current conformation of the city's waterfront. The result of this wide-ranging cognitive investigation has shown that to the city of Naples the sea is an essential element, in relation to the shape of the city, its history and its identity values (Russo, 2010).

From the phase of knowledge of the factors that have contributed to determine the current state of the waterfront, the study moved on to the elements that can influence the processes of transformation, in order to define a cognitive framework to base the transformative instances, in a concrete and well-founded way, with the main purpose of defining a project that is based on reality. A fundamental step of the research is characterized by the detailed analysis of the waterfront, which is based on two main perspectives: accessibility and functionality and the evaluation of vulnerability to climate impacts.

The research seeks to structure a waterfront analysis approach with two aims:

- implement waterfront reading capacity by information reorganization and information heritage enrichment through remote sensing analysis and ICT;
- structure the criteria and phases that allow an overall reading of the waterfront area in order to perceive the territorial effects of the different problems combined with the risks arising from climate impacts.

With regard to the analysis of accessibility and functionality the research identifies the roads closest to the coastline. In this way, the thick layout has been broken down into a series of signs that differ according to the role that roads assume in the

Tab 1: Final values related to the analysis of the different stretches of the waterfront in Naples.

total	ACCESSIBLE					NOT ACCESSIBLE											
	tactile			not tactile		cliff	pontile						penitentiary area	natural limit	concession to private/tidos	private areas access	artificial limit
	natural		artificial		private pier		pleasure wharf	pedestrian pier	military dock	freight dock	passenger jetty						
	seaside	turf	widenind	misuse cliff								jetti					
54.375	1.890	70	665	4.675	670	9.670	380	3.840	760	2.760	12.265	4.435	605	5.535	1.835	2.020	2.300
100,00%	3,48%	0,13%	1,22%	8,60%	1,23%	17,78%	0,70%	7,06%	1,40%	5,08%	22,56%	8,16%	1,11%	10,18%	3,37%	3,71%	4,23%
accessibility	7.970					46.405											
accessibility	14.66%					85.34%											

Source: authors' elaboration.

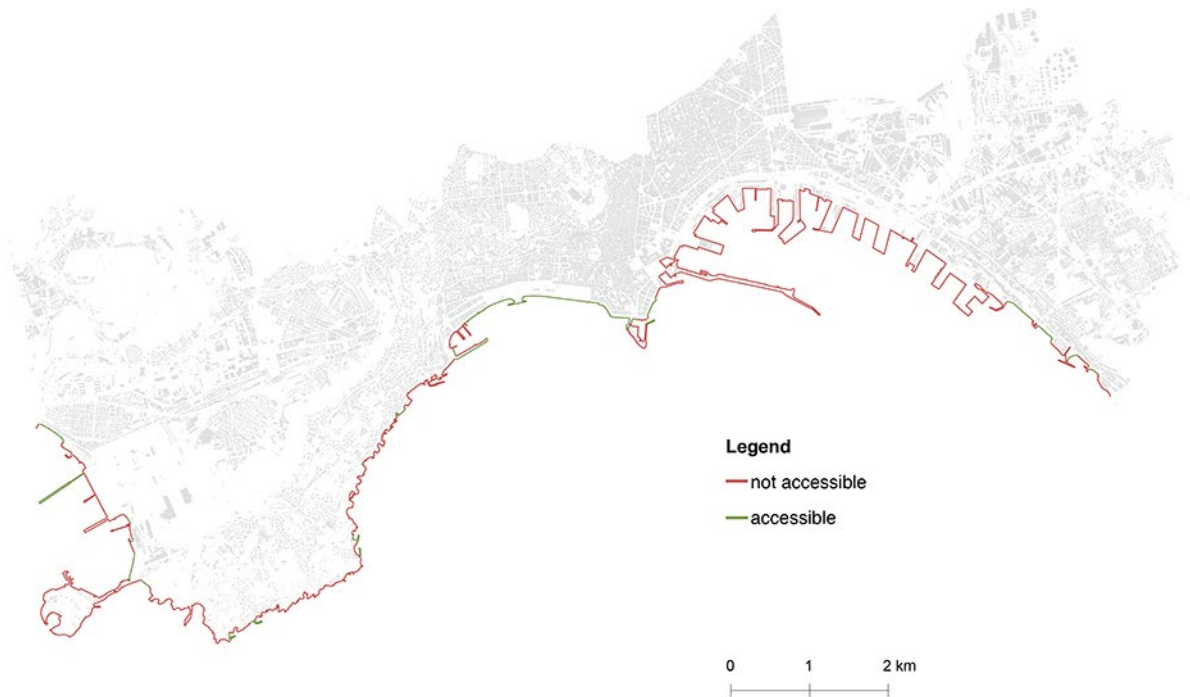


Figure 3: Classification of waterfront coastlines with respect to accessibility to the sea.
Source: drawing by authors

relationship between the city and the sea (figure 2). The role was determined following a series of surveys and detailed study of the identified street highlighting their main characteristics, permeability and accessibility to the sea. The study shows that a large portion of the city has no direct relationship with its sea; only a limited central part of the waterfront is permeable in its almost totality. The precise study found the alternation of parts in which access to the sea is subordinated to a series of secondary roads (mainly private), and others, in which the presence of separating axes interrupts any kind of relationship between the city and the waterfront, sometimes even preventing its perception.

As shown on the map, the eastern area of the city seems to be characterized by a continuous line, a barrier, which does not allow any access to the waterfront. In this sense, in fact, most of the city's weaves are interrupted near this road, creating a real limit. The axis in fact, on the waterfront side, is delimited by gates and walls, elements that determine strong signs, not even allowing to perceive the presence of the sea. The map also identifies the historical structure and some recognizable axes characterizing the City, whose extensions seem to continue into the sea through the docks. The urban network seems to be strongly connected with the

waterfront, whose docks seem to follow the morphological rules of the road system. This relationship, however, although evident, is interrupted by the presence of the dividing axes described above. The waterfront of the city of Naples is very heterogeneous both for orographic conformation and for the relationship of interchange of the urban fabric with the sea.

With regard to the second phase of this analysis, a categorization of the different stretches of coast has been defined. For each stretch, its compliance with accessibility criteria based on the "direct" relationship between sea and city, or as a denial of this relationship, was evaluated.

At first, in fact, the coast was divided into 170 stretches that can be edited in the seventeen explanatory subcategories of the city-sea relationship (table 1).

Related to the accessibility principle, the paper aims to identify the man-sea relationship, on the basis of usability, understood as a tactile relationship, as the ability to reach the sea without juxtaposition or obstacles; only 4.83% of the total development offers this opportunity.

In reality, with a percentage of 8.60% on the entire coastal strip, more than double the physical accessibility described above (4.83%), the improper and promiscuous use of some cliffs is clearly func-

tional to the needs of the population, bringing accessibility to 7.30 km and raising the percentage value to 13.43% of the total coastline.

The research shows the almost total negation of the city's relationship with the sea (figure 3): of the linear development of Naples' waterfront, in fact, only 14.66% is accessible and usable. This figure assumes even more significant value considering that the evaluation was based on an extended principle of accessibility, which also included stretches of coast for informal use. In fact, as described above, in response to their needs without any regulation, the Neapolitans have decided to re-appropriate some stretches of coast.

Finally, the last part is dedicated to the vulnerability evaluation to climate impacts, proceeding with the identification of the most sensitive areas to the impacts resulting from three hazards considered: heat waves, sea level rise and increase in extreme weather phenomena. For each hazard, one or two impacts were considered, by highlighting the most sensitive areas.

The aim of the work was the geographic identification of vulnerable areas in the city, through a classification on a neighborhood scale, in order to direct the adaptation strategies in the most exposed areas to the climatic impact. To do this, have been

produced new spatial information not currently available in the administrative spatial databases.

By remote sensing analysis and the acquisition of satellite data, new Shape Files have been created like Land Surface Temperature and NDVI Index.

The new spatial data, interpolated with the existing ones, have allowed the spatial assessment of the vulnerabilities to the three defined hazards.

Figure 4, which summarizes the territorial vulnerability to the impacts considered, shows that most of the waterfront is exposed and vulnerable to externalities from climate change. The analysis also highlights the need to consider climate change adaptation solutions within the processes inherent to water management and the project phases aimed at the redevelopment of the waterfront.

5. DECOMPOSING FOR RECOMPOSING

The various analyses carried out make it clear that the waterfront of Naples presents itself as a kaleidoscope, a succession of different landscapes, each one a palimpsest of specific stratifications. A complex reality that alternates characteristics and urban sceneries that are remarkably different

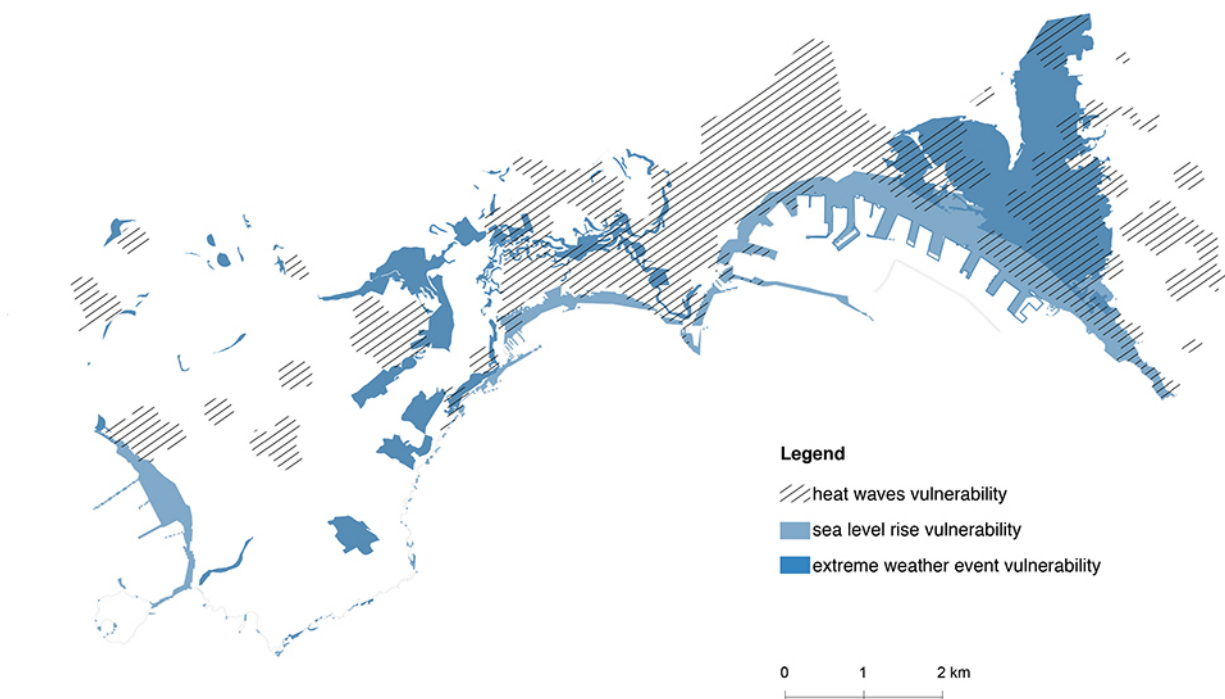


Figure 4: Summary of vulnerability classification maps with respect to impacts: heat waves, sea level rise and intense weather events. *Source: drawing by authors*

from each other, sometimes antithetical, but that together generate a unique and unrepeatable design, universally recognized. On the basis of what has just been said, the change of scale required for the in-depth analysis, has led to the subdivision of the waterfront into seven transepts with homogeneous characteristics but with diversified realities, each characterized by its own physical-morphological, historical, socio-cultural and economic specificities.

In particular has been identified, a methodology that is potentially replicable, after adaptation and modelling to the reference contexts, called “decompose to recompose” (figure 5). The methodology first decomposes the waterfront to analyse and emphasize those elements that could get lost in a macroscale analysis, and then recompose it through the definition of strategies.

The proposed methodology is then composed, specifically, of five phases:

1. waterfront analysis;
2. partitioning into transepts;
3. transepts summary and evaluation;
4. vocations identification and spatial configuration;
5. strategies definition.

The first phase is affected by the various analyses described above. In the second phase starting from the results of the analysis, the waterfront was divided into seven transepts (Bagnoli, Posillipo, Lungomare, Porto Monumentale, Porto Commerciale, Porto Industriale and San Giovanni), which differ from each other for multiple characteristics, but are never separate units or sub-systems. In fact, they are always somehow connected and, in this sense, must always be thought of as a whole. The waterfront was divided into the seven transepts and then, in the third phase, a description of each of them was made, by highlighting their main characteristics, historical events, representative elements, explaining problems and opportunities. The description of each transept has therefore, in the fourth phase, led to the definition of three vocations for each of them, interpreted as an explanation of the representative and characterizing issues of the reference quadrant. For the seven identified transepts, the vocation was then intercepted from the point of view of its spatial configuration.

The deconstruction of the different transepts and the explanation of their respective vocations, as well as the definition of the urban peculiarities that characterize each transept, become, there-

fore, the basis for the identification of the objectives, as well as the strategies and the subsequent definition of the actions.

In this sense, in the last phase, it can be seen a reunion of the analyses with the project perspectives, starting from the definitions of coast that highlight the problems and potential of each area. From this point of view, in fact, the inhomogeneity of the waterfront along its extension and the precise peculiarities that characterize it, determine the need to define strategies able to adapt to these often antithetical alternatives in order to generate an overall vision.

Therefore, the indications on the application of the strategies are made explicit, idealizing a changeable path in its features that present different characteristics that are not only on the coast, but also in the territory behind it.

In the case of Porto Monumentale transept, for example, three main objectives have been identified with relative strategies which can be summarized as follows (figure 6):

1. Sea-city reintegration:
 - existing connections enhancement, able to overcoming the obstacle represented by the transversal axis to recreate the city-waterfront continuum;
 - green path creation, with a dual function: reconnecting the “infiltration” paths and creating a continuity relationship between the various buildings to be redeveloped and the waterfront;
 - identification of Piazzale Immacolatella as a new intermodal hub of connection.
2. Enhancement of “empty on hold”
 - redevelopment and restitution of Molo San Vincenzo to the citizen through its conversion into a collective promenade;
 - disused volumes recovery and re-functionalization with innovation in terms of image and functions while preserving their identity; creation of an articulated system of relations between the various disused buildings to release them from the current condition of isolation with the aim of initiating a multiscale metamorphosis;
 - degraded green urban area valorization and residual and interstitial spaces redevelopment;
3. Common ground e intersectoriality:
 - governance process creation through new tools/methods/methodologies, combined with the opening of comparison tables be-



Figure 5: Illustration of the methodological processes applied in the study. *Source: drawing by authors*

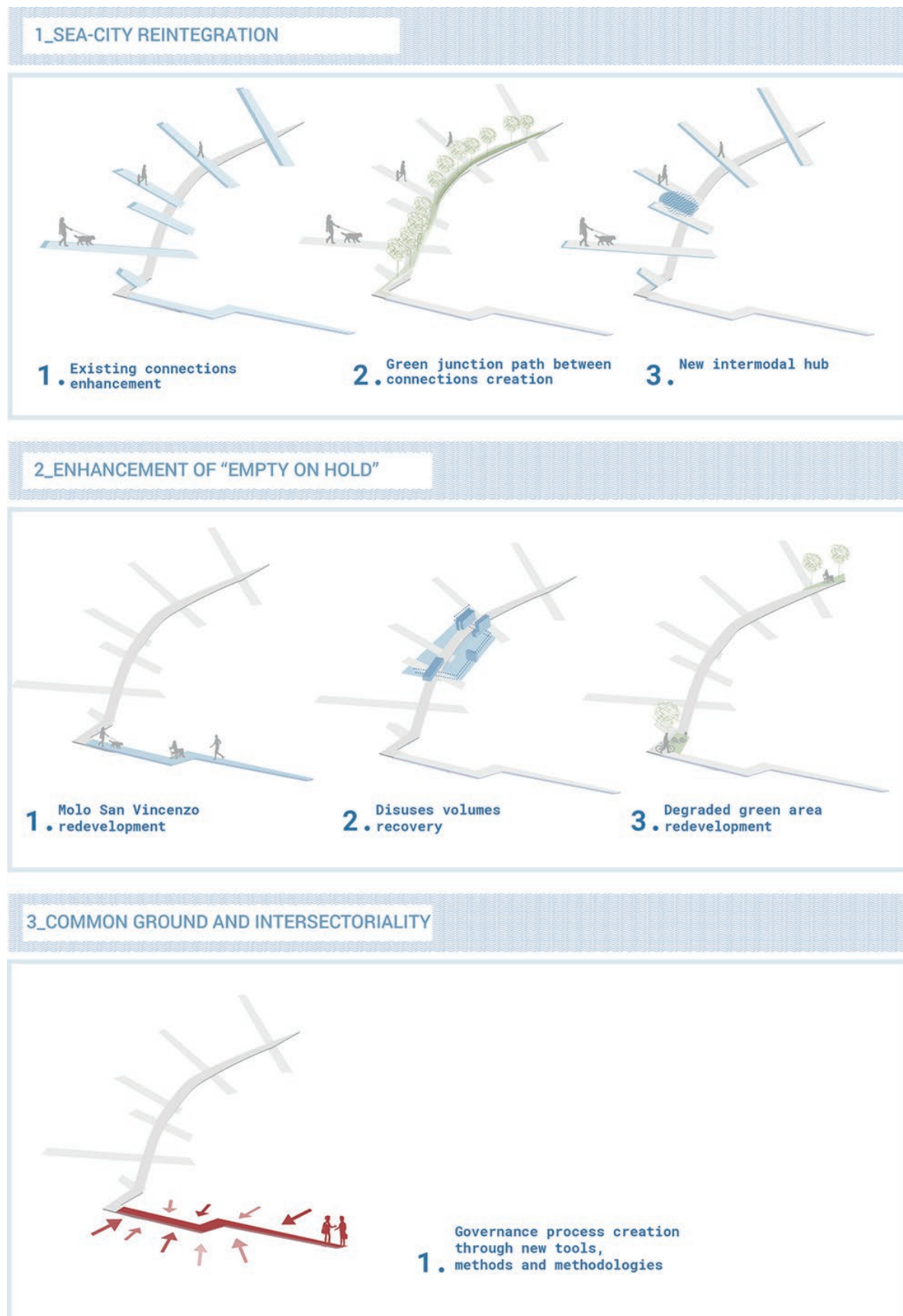


Figure 6: Porto Monumentale strategies. *Source: drawing by authors*

tween Port Authorities, Navy, Public Administration, Associations, Owners and Citizens, able to overcome the impasse and immobility of governance, as well as the logic of sectorial policies, with a view to greater integration, sharing and cooperation between the actors involved.

It is important to point out that, in this last phase, it is witnessed a recomposition of the waterfront through strategies and consequent actions that, although applied to a limited area, often overstep its boundaries both for application needs compared to the created perimeters, and for reverberation effects on much larger portions compared to the intervention transept.

What has been described above, demonstrates the intrinsic potential of urban transformations which, by generating induced processes, often live by spontaneous budding well beyond the areas of intervention, following often unsurpassed and unexpected propulsive motions.

It was considered important, given the heterogeneity of the coast, to always consider the characteristic features that make it up, evaluating the opportunity or the need for interventions to respond to a system of actions coordinated with each other in a metropolitan perspective.

6. CONCLUSIONS

In conclusion, the value of the waterfront in urban setting is evident, to which the intimate relationship between the sea and the construction of places should be recognized.

It must be considered that in the field of waterfront, planning lives a complex system of attributions of addresses and choices related to these urban areas. In fact, the urban planning plans at municipal level, in full respect of the indications of the higher-level plans, indicate a vision of the entire municipal territory and dictate the compositional rules for its implementation. Although in the process of the plan there are many moments of confrontation of all the institutions that may have repercussions from the effects of the plan, these processes do not find a real moment of growth, coordination and integration between the actors involved. With regard to the concept of waterfront, the port plans, of the sector, often suffer from a strategic logic to the efficiency of the sector func-

tions and are not integrated in the global visions of transformation of the coastline.

It is clear, therefore, that there is a problem of partial and often conflictual governance. It would be desirable that the guidelines to base the choices of transformation of cities or portions of them, for example the waterfront, arise from participatory urban planning workshops. These guidelines should be applied on the basis of specific competencies in a relationship of applied synergy, respecting the individual roles assigned, in an equal way safeguarding both stakeholders and the interests of citizenship.

It appears, therefore, that the true integration of all skills, knowledge and interests passes through a governance to be built in a concerted way, in order to obtain a "shared" vision aimed at the growth of a united and supportive city that also respects the safety and security risks coming from climate change.

In particular, this field of reflection offers possibilities for research and experimentation, through the construction of a new key to reading that knows how to integrate the methods, tools and theoretical approaches of the territorial project related to these parts of cities with those coming from the strategies of mitigation and adaptation to climate change.

The challenge of the new generation redevelopment is therefore called to integrate the different issues outlined so far, with the need to evolve from a project-related approach to a more adaptive vision, able to take on board the awareness that climate change issues have become extremely complex and need to be taken into account in planning tools.

Referring to the analyzed case of the city of Naples, it is important to underline how the delineation of the most vulnerable areas to the impacts deriving from climate change and the subsequent definition of the redevelopment strategies, can represent a model able to adapt to the various project contexts in the framework of climate resilience and sustainability.

This means that waterfront redevelopment cannot disregard what is a preliminary identification of the most vulnerable areas, implemented by means of appropriate analysis according to the contexts, capable of subsequently directing the project strategies on the one hand and the decision-making processes related to the intervention priorities on the other.

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